Surviving a zombie apocalypse using mathematics

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Researchers at the University of Sheffield have explained how to survive a zombie apocalypse this Halloween using maths, in a new outreach

project designed to highlight the importance of vaccinations.

The project, developed by maths Ph.D. students at the University of Sheffield, has been showing the public how we can apply maths to a zombie apocalypse situation to explain how we understand the spread of disease in the real world.

The mathematicians used an SIR model to show how attempting to fight the zombies would lead to more people becoming infected and coming back as a zombie. Sending in the military was another option they considered but this lead to the same output.

The SIR model looks at people susceptible to a disease, those infected and those recovered. For example in the zombie model, humans are susceptible, the zombies are infected and the domesticated zombies are recovered.

Hiding from the zombies was the second best choice meaning humans could survive longer if they could not be found. The researchers showed the best method would be to domesticate the zombies, in real life this would be the equivalent of vaccination.

Although the project is based on an imaginary situation, the underlying maths is widely used to help scientists, medics and public health professionals model and map the spread of disease.

The researchers used a mathematical model which is the classic framework for modelling disease spread in human, agricultural and natural populations. It is also used to calculate how many people in a population need to be vaccinated to prevent a disease from spreading.

Dr. Alex Best, from the University of Sheffield's School of Mathematics and Statistics, said: "At the University of Sheffield, myself and others

use exactly these sorts of mathematical models to understand how infectious diseases emerge, spread and evolve, not just in humans but in the natural world too.

"These models allow us to explain real-world data, make predictions about future disease outbreaks or control measures, and to gain a deeper understanding of the natural environment."

The project was presented to the public at Green Man Festival in Wales. The researchers created a "zombie outbreak" by giving one person some wristbands to give out to "infect" other people. The "zombies" could then come back to the researchers to learn about the project and get more wristbands to spread the infection. At the end of the event there were over 2,000 "zombies."

Fay Frost, a Ph.D. researcher involved in the project from the University of Sheffield, said: "The project we presented to the public highlights the exciting possibilities of mathematics and hopefully helps to break down the inherent fear associated with the subject.

"With this project we used a fun familiar concept to represent real research into disease conducted at the University of Sheffield."

The project was inspired by research from mathematicians in Canada and the research of University of Sheffield Ph.D. student Rhys Munden.

The University of Sheffield's School of Mathematics and Statistics is home to experts in pure mathematics, applied mathematics and probability and statistics. Their research is helping to bring new understanding to the complex mathematical structures that the modern world is built on, with applications in disciplines ranging from finance to healthcare.